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2022

Mathematics

[HONOURS]

(CBCS)

(B.Sc. Fifth Semester End Examinations-2022)

MTMH-DSE-501

Full Marks: 60 ***Time: 03 Hrs***

The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as far as practicable
Illustrate the answers wherever necessary

Linear Programming Problem

1. Answer any ten questions **10x2=20**

a) Define a convex set. Give an example of a non-convex set.

b) State fundamental theorem of LPP

c) Under what condition on LPP will have unbounded solution and infinite solution ?

d) Explain the difference between a basic solution and a degenerate basic solution.

e) Find the Extreme point if any of the set

$X = \{(x, y) / |x| \leq 1, |y| \leq 1\}$

f) State why an assignment problem is not a L.P.P.

g) Determine the convex hull of the points (0,0), (0,1), (1,2), (1,1), (4,0).

h) Describe the two person xero sum game.

i) Using north-west-corner method find initial basic feasible solution to the Transportation problem

	D_1	D_2	D_3	
O_1	10	8	7	10
O_2	6	9	8	15
	6	3	6	

j) Show that dual of dual problem is primal.

k) Explain "saddle point" and "dominance" as applied to a game.

l) Prove that {(1,0,0), (1,1,0) (1,1,1)} span E^3.

m) Find all basic solutions of the system of Equation

$$x_1 + 4x_2 + x_3 = 3$$
$$5x_1 + 2x_2 + 3x_3 = 4$$

n) Define an extreme point and give an example of a convex set which has no extreme point.

o) Consider the game G with the following pay off

	B_1	B_2
A_1	2	6
A_2	2	μ

Show that G is strictly determinable whatever μ may be.

2. Answer any four questions **4x5=20**

a) A farmer buys sheep and goats at Rs 80 per sheep and at Rs 100 per goat and sells them at a profit of Rs 10 per sheep and Rs 15 per goat. The farmer has an accommodation for not more than 50 animals and can not afford to pay more than Rs 4400. He wishes to buy these two kinds of animals in order to have the maximum profit. Pose an L.P.P for this problem.

b) $x_1 = 1, x_2 = 1, x_3 = 1$ and $x_4 - 0$ is a feasible solution of the system of equations

$$x_1 + 2x_2 + 4x_3 + x_4 = 7$$
$$2x_1 - x_2 + 3x_3 - 2x_4 = 4$$

Reduce the feasible solution to two different basic feasible solution

c) Apply maximum and minimum principle to solve the game whose pay off matrix is given below:

	B_1	B_2	B_3	B_4
O_1	-5	2	0	7
O_2	5	6	4	8
O_3	4	0	2	-3

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d) Solve the following transportation problem

	D_1	D_2	D_3	Capacities
O_1	-5	2	0	120
O_2	5	6	4	80
O_3	4	0	2	80
Requirement	150	80	50	

e) If $\underline{\gamma}$ and $\overline{\gamma}$ denote the maximin and minimax values of a game with pay off matrix $(a_{ij})_{m\times n}$, then prove that $\underline{\gamma} \le \overline{\gamma}$.

f) Prove that a basic feasible solution to a L.P.P corresponds to an extreme point of the convex set of feasible solution.

g) Solve the following L.P.P. by using two-phase simplex method.

Max $z = 5x_1 + 3x_2$

Sub to $2x_1 + x_2 \le 1$

$3x_1 + 4x_2 \ge 16$

$x_1, x_2 \ge 0$

3. Answer any two questions **2x10=20**

a) Solve the Travelling salesman problem.

	1	2	3	4	5
1	∞	6	12	6	4
2	6	∞	10	5	4
3	8	7	∞	11	3
4	5	4	11	-∞	5
5	5	2	7	8	∞

b) Solve by "Big M Method"

Max $z = x_1 - 2x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1, x_2, x_3 \ge 0$

c) Solve the game problem reducing into problem using dominance property.

B

A		B_1	B_2	B_3	B_4	B_5
	A_1	0	0	0	0	0
	A_2	4	2	0	2	1
	A_3	4	3	1	3	2
	A_4	4	3	4	-1	2

d) Solve the transportation Problem.

	D_1	D_2	D_3	D_4	
O_1	1	2	-2	3	70
O_2	2	4	0	1	38
O_3	1	2	-2	5	32
	40	28	30	42	